# Great Smoky Mountains National Park

## Cades Cove Opportunities Plan

# Appendix D Natural Resources Conditions Report

October 2004

United States Department
Of the Interior
National Park Service

### **Table of Contents**

Study Area	1
Geology	1
Vegetation	2
Water Resources.	2
Wildlife	5
Animals and Plants of the Cove.	5
Exotic Species.	7
Exotic Vegetation.	7
Air Quality.	9
Air Quality Monitoring and Research	9
Impacts of Air Pollution	10
Regulatory Agencies	10
Air Quality Standings.	
NPS Position on Air Pollution.	11
Natural Resources Overview	11
Public Input on Impacts of Visitation	12
Management	12
Objectives of the DRAFT Land Management Plan	
Current Management Activities	
Benefits Derived from Land Management.	
Aquatic Life.	
Action Steps of the DRAFT Management Plan.	
Natural Resources Management History	
References	
List of Figures	
Figure 1: Cades Cove Geology.	2
Figure 2: Cades Cove Vegetation.	
Figure 3: Cades Cove Watershed.	
Figure 4: Visitors Stop Along Loop Road	
Figure 5: Canebreak and Meadow Restoration Sites.	17
rigure 5. Carlebreak and Meddow Residration Siles.	17
List of Tables	
	,
Table 1: Animal and Plant Species of Management Concern.	
Table 2: Exotic Plant Species in Cades Cove	ช

#### **Natural Resources Conditions Report**

This report seeks to provide a base of natural resource information to inform the planning process and to begin assessing the impacts of visitation, if any, on the Cove's natural resources. It also looks at past management practices and identifies areas that merit further study. To complete this report, existing reports and management plans for Great Smoky Mountains National Park and the Cades Cove District were reviewed. In addition, information from minimal field work and meetings with the Great Smoky Mountain National Park's Natural Resources staff has been incorporated.

#### **Study Area**

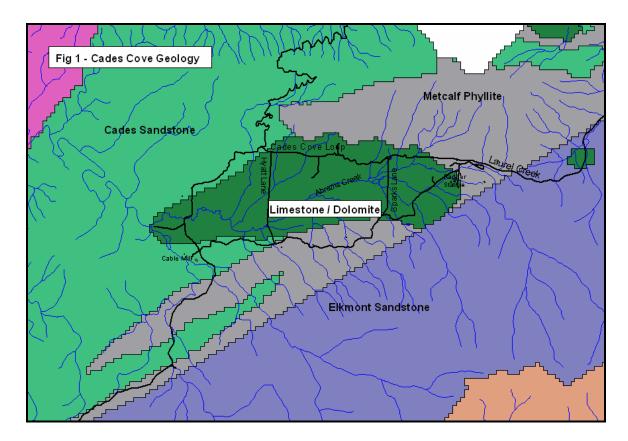
The Cades Cove Opportunities Plan has focused is upon the valley floor of Cades Cove where the majority of visitor use is concentrated. This report also has focused upon the valley floor and the natural resources found there. However, the valley and its resources are best understood in context with its surroundings. The maps in this report provide information about the mountains that surround the valley.

Today, the Cove provides a unique natural setting in Great Smoky Mountains National Park, a broad 2,500-acre valley floor surrounded by wooded mountainsides. The natural resources that serve today as an attraction to visitors were used by Native Americans and the Euro-Americans who settled in the Cove. The Cove was used to grow crops, raise livestock and hunt. It provided sustenance to a small community that grew to more than 700 families at its peak. The culture and history of Cades Cove was built upon the abundance of natural resources the Cove.

#### Geology

The Cove includes 2,700 acres (1,096 hectares) of limestone dolomite. Geologically speaking, this is a natural "window" of younger limestone surrounded by an otherwise ancient, acidic-based rock complex. Figure 1 provides a map of the limestone/dolomite area within the Cove.

The Cove also features geologic features such as sink holes, rock outcroppings, and Gregory Cave, a known habitat of the Indiana Bat, a threatened and endangered species. This small cave, located between Sparks Lane and the Primitive Baptist Church access road, is closed to visitors.



#### Vegetation

The Cove's open meadows are consistent with the dolomite limestone geology of the area. The approximately 2,500 acres of meadow are not completely open. The rolling valley floor has stands of trees (wood lots) and small hills. The forested mountains surrounding the Cove provide a diverse backdrop of vegetation that include Xeric Oak, Tulip Poplar, Pine, Pine-Oak, Northern Hardwood, Mixed Mesic Hardwood, and Cove Hardwood. Figure 2 shows the vegetation within and surrounding the Cove.

#### **Water Resources**

Water is an important component of the Cove. Thirty-four streams and tributaries enter the Cove from the surrounding mountains and crisscross the valley floor. The primary water course is Abrams Creek, which flows through the picnic area and bisects the Cove on a southwesterly path. Other streams include: Arbutus Branch,

Bunting Branch, Cades Branch, Cooper Branch, Crooked Arm Branch, Fanny Branch, Feezell Branch, Forge Creek, Green Branch, Harrison Branch, Houston Chambers Pond, Maple Branch, Marthas Branch, McCaulley Branch, Mill Creek, Oliver Branch, Rowans Creek, Sea Branch, Stillhouse Branch, Tater Branch, Victory Branch Whistling Branch, Wildcat Branch, and eight other unnamed streams.

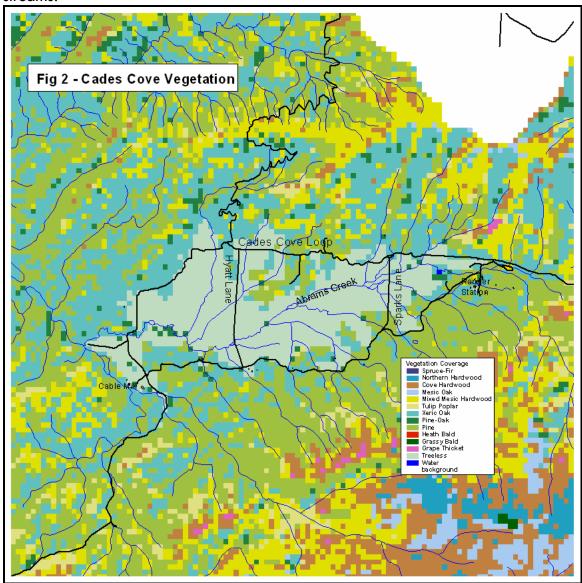
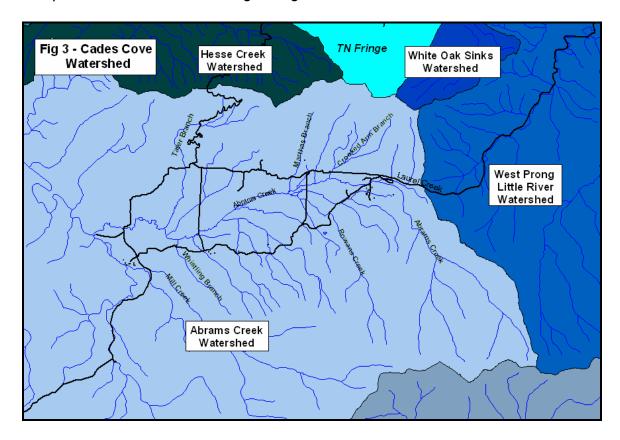


Figure 3 depicts the Cades Cove watershed, as well as the creeks, streams, and tributaries that flow through the Cove.

Under the authority of the Tennessee Department of Environment and Conservation, the Water Quality Control Board has designated Abrams Creek as one of the state's Outstanding National Resource Waters (ONRWs). ORNWs have been found to be

high quality waters that constitute an outstanding national resource and/or have exceptional recreational or ecological significance.



Abrams Creek has a Tier III designation under ONRW. According to the Clean Water Act, such a designation means that the creek's high quality must be maintained. In surface waters designated as ONRWs, no new discharges, expansions or existing discharges or mixing zones will be permitted unless such activity can consistently meet or exceed the water quality condition of the designation or unless the activity will not permanently degrade water quality.

Existing water quality is used to determine whether such a designation is merited. Upon designation, existing discharges, including existing upstream discharges, are allowed at present levels, and physical alternations that degrade the water within the ONRW are not allowed.

Biologists have spent more than 15 years restoring stream banks and returning native fish species, including the smokey madtom, yellowfin madtom and duskytail darter, to Abrams Creek. The creek is considered ideal for restoration because its pH is close to neutral and its warm waters are conducive to spawning. The creek also has several special habitat niches for the native species and an abundance of insects that the species prefer as food.

#### Wildlife

One of the most popular visitor activities in Cades Cove is wildlife viewing. The 11-mile Loop Road that follows the edge of the Cove provides panoramic vistas of the open meadows. These open meadows provide habitat for a wide variety of wildlife, most prominently White Tail Deer. The Cove also provides a habitat for black bear, several species of birds, small mammals, and aquatic life.

#### Animals and Plants of the Cove

Cades Cove harbors several specialized habitats, including limestone sinkhole ponds, caves, canebrakes, several different wetlands, large springs, rare variations of montane alluvial forest, and tall-grass meadows. These diverse natural communities provide habitat for several rare species, including two that are found nowhere else in the world and several new-to-science species.

The National Park Service considers the animal and plant species in Table 1 "of management concern." These species have been identified as being critically imperiled, imperiled, or rare. This list was used to guide the development of long range management alternatives for Cades Cove.

Table 1: Animal and Plant Species of Management Concern

Species Name	Common Name	Park Status	TN Status	Federal Status
ANIMAL SPECIES LISTING		0.000	1 0.000	
Hemidactylium scutatum	Four-Toed Salamander	3	D	
Coragyps atratus	Black Vulture	2		
Limnothlypis swainsonii	Swainson's Warbler	2	3	
Hemitremia flamea	Flame Chub	1	S	
Myotis sodalist	Indiana Bat *	1	Е	Е
,	E. Narrowmouth Toad	1		
	Mole Salamander	1		
Corynorhinus refinesquii	Rafinesque's Big-Eared Bat	2	D	
PLANT SPECIES LISTING				1
Ruellia humilis	Hairy Wild Petunia	Н		
Cardamine flagellifera	Bitter Cress	1	T	
Cardamine dissecta	Divided Toothwort	1	4 or 5	
Campanula aparinoides	Marsh Bellflower	1	S	
Stellaria longifolia	Longleaf Stichwort	1	Е	
Euonymus atropurpureus	Wahoo	1	R	
Quercus muehlenbergii	Yellow Oak	1	R	
Frasera caroliniensis	Carolina Gentain	1		
Sabatia campanulata	Slender Marsh Pink	1	R	
Agastache nepetoides	Giant Hyssop	1		
Monotropsis ororata	Sweet Pinesap	1	Т	
Epilobium ciliatum	Hairy Willow-Herb	1	S	
Lysimachia hybrida	Lance-Leaf Loosestrife	1	R	
Crateaegus calpodendron	Pear Hawthorn	2	R	
Verbena simplex	Narrow-Leaved Vervain	1	R	
Carex austrocaroliniana	South Carolina Sedge	2	2 or 3	
Carex jamesii	Nebraska Sedge	1		
Carex trisperma	Three-seeded Sedge	2		
Corallorrhiza wisteriana	Spring Coralroot	1	S	
Platanthera lacera	Green-Fringe Orchis	1	R	
Platanthera peramoena	Purple Fringeless Orchid	1	Т	
Agrostis mertensii	Northern Bentgrass	1		
Woodwardia virginica	Virginia Chainfern	Х	2	
Xyris torta	Yellow-eyed Grass	1		
Anolis carolinensis	Green Anole	4	3	
Juglans cinerea	Butternut	2		Species of concern

<sup>\*</sup> Maternal colonies and within roosting radius of the hibernacula.

	KEY TO TABLE 1
1 =	Critically imperiled (typically 5 or fewer)
2 =	Imperiled (6 to 20 occurrences).
3 =	Rare or uncommon (21 to 100 occurrences).
4 =	Widespread, abundant, and apparently secure, but with cause for long-term concern (usually more than 100 occurrences).
5 =	Demonstrably widespread, abundant, and secure.
X =	Extirpated
T =	Threatened
E =	Endangered
D=	Deemed in need of management
S =	Special concern species
R =	Reported
H =	Historical record

#### **Exotic Species**

Exotic species are defined by the National Park Service as species that occupy or could occupy park lands directly or indirectly as the result of deliberate or accidental human activities. Exotic species also are commonly referred to as non-native, alien, or invasive species. Because an exotic species, by definition, has not evolved in concert with a species native to a place, exotic species are not a natural component of the natural ecosystem of that place.

National Park Service management policies direct that exotic species that are not maintained to meet an identified park purpose be managed up to and including eradication if prudent and feasible and the exotic species:

- Interferes with natural processes and the perpetuation of natural features, native species or natural habitats; or
- Disrupts the genetic integrity of native species; or
- Disrupts the accurate presentation of a cultural landscape; or
- Damages cultural resources; or
- Significantly hampers the management of park or adjacent lands; or
- Poses a public health hazard as advised by the U.S. Public Health Service; or
- Creates a hazard to public safety.

#### **Exotic Vegetation**

The primary exotic vegetation in Cades Cove are the Tall Fescue (*Festuca pratensis*) and *Sericea Lespedezea* (*Lespedeza cuneata*). The Tall Fescue dominates most of the open field environment in the Cove. A major problem with Tall Fescue is that it often

contains the toxic fungi ergotamine and egrovaline. These fungi cause sickness and lower conception rates in both domestic and wild animals. In addition, when compared to native grasses, these exotics provide little cover for small mammals, ground nesting birds, insects, and other small animals.

In addition to Tall Fescue and *Sericea Lespedeza*, there are several other exotic, invasive plant species in the Cove. To manage the historic and natural landscape of the Cove, the National Park Service is striving to reduce or eliminate the following species because of their invasive and aggressive tendencies:

Table 2: Exotic Plant Species in Cades Cove

Species	Common Name	Severity Rank
Ailanthus altissima	Tree of Heaven	2
	Musk Thistle	2
Carduus nutans		Z
Cirsium vulgare	Bull Thistle	
Coronilla varia	Common Vetch	
Dioscorea batatas	Chinese Yam	2
Festuca pratensis	Tall Fescue	3
Lespedeza bicolor	Japanes Lespedeza	2
Lespedeza cuneata	Sericea	3
Ligustrum vulgare	Privet	2
Lonicera japonica	Japanese Honeysuckle	2
Microstegium vimineum	Japanese grass	1
Pueraria Montana	Kudzu	2
Ranunculus bulbosus	Bulbous Buttercup	3
Rorippa nasturtuim-	Watercress	ś
aquaticum		
Rosa multiflora	Multiflora Rose	2
Sorghum halepense	Johnson Grass	2
Verbascum thapsus	Common Mullein	2
Holcus lanatus	Velvet grass	2
Vinca minor	Periwinkle	3

	Key to Severity Ranking
1	These exotic plants are invasive and aggressive, capable of displacing native species, and noxious to native plant communities. They exhibit rapid spread from localized communities, and eradication is unlikely once populations are established. Control can be effective in limiting spread and in eradication of localized or recent infestations. Surveying and monitoring for these species should be done on an annual basis, particularly where the integrity of natural or cultural features is threatened.
2	These exotic plants are invasive and aggressive, capable of displacing native species, and noxious to native plant communities. They spread rapidly from localized communities, and eradication is possible with considerable labor resources. Control actions have at least a moderate probability of reducing or eliminating established populations. Surveying and monitoring should be done on an annual basis.
3	These exotic plants are invasive but less aggressive, less capable of displacing native species,

	and are undesirable but not usually noxious. Populations are typically localized with gradual spread. Control actions have a high probability of eradicating or reducing populations. Surveying and monitoring should be focused on areas where these exotics threaten natural or cultural features.
4	These exotics are less invasive, aggressive and capable of displacing native species. The distribution of plant populations is variable; distribution of plant populations is variable but typically localized. They are relatively innocuous exotics for which limited control efforts are foreseen. Surveying and monitoring are limited.

It is important to note that exotic, non-invasive species important to the cultural landscape (i.e., daffodils, fruit trees, boxwoods) remain in Cades Cove. These are species that were planted around homestead sites and other structures in the Cove by settlers. These species should be managed and maintained as a part of the historic landscape.

#### **Air Quality**

Great Smoky Mountain National Park is one of 49 units of the National Park Service designated as Class I Parks. Congress made this designation in 1977 to protect parks from damage caused by air pollution. A Class I Park receives the most stringent degree of air quality protection within and around its borders. For example, potential new or modified sources of significant pollution that plan to locate near a Class I Park must obtain a permit from the applicable air quality regulatory agency. The National Park Service has significant input to the permitting process to ensure that potential air emissions do not pose a threat to visibility or other park air quality related values.

#### Air Quality Monitoring and Research

Air quality monitoring and research is carried out by the Air Resources Division of the National Park Service. This Division monitors gaseous pollutants and deposition and collects/analyzes data on the effects of air pollution on visibility, biological populations, and ecosystems. The Division also develops and applies air pollution transport models and brings all information together to allow for the review and permit of new stationary sources of air pollution. In addition, the Division uses research to influence decisions of state and federal regulatory agencies and to educate the public on the threats of air pollution to park resources.

Monitoring of air pollution in Great Smoky Mountain National Park has been underway since 1980. The analysis of these data has indicated that forests, soils, surface waters, and visibility in Great Smoky Mountain National Park are experiencing adverse impacts from air pollution.

Evidence indicates that sources of air pollution outside the boundaries of Great Smoky Mountain National Park are affecting resources. Great Smoky Mountain National Park is located downwind of many urban and industrial areas that generate millions of tons of air pollution annually. Based on monitoring data, review of scientific literature, and field reconnaissance, it has been determined that Great Smoky Mountain National Park resources are being adversely affected by a variety of air pollutants – O<sub>3</sub> (Ozone), as well as NO<sub>2</sub> and SO<sub>2</sub>. O<sub>3</sub> (Ozone) was identified as a priority pollutant of concern to biological resources. The Air Resources Division has undertaken a range of actions, from increasing public awareness through interpretive exhibits, to coordinating with state and regional agencies regarding issues of air pollution.

During public input meetings held during May and July 2002, the project team received several comments about air pollution in the Cove. Most of these concerns regarded the large number of private vehicles that travel bumper-to-bumper around the Cove, generating air pollution. While it is true that the private automobile is a source of air pollution in the Cove and in the Park, it is also important to note that Great Smoky Mountain National Park is affected by both point and non-point sources of air pollution. The National Park Service has an overall objective to reduce air pollution, not only in Cades Cove, but in the entire region of Great Smoky Mountain National Park.

#### Impacts of Air Pollution

Air pollution generates many impacts in Great Smoky Mountain National Park, including effects on human health, plants, and the aesthetic appearance of the Park. Here is a list of a few of the impacts:

- Views from the overlooks at Great Smoky Mountain National Park have been seriously degraded over the last 50 years by human-made pollution.
- Ozone pollution threatens human health and Great Smoky Mountain National Park plants.
- Ozone exposures in Great Smoky Mountain National Park are among the highest in the East.
- Great Smoky Mountain National Park receives the highest sulfur and nitrogen deposits of any monitored national park, causing acid rain, acid clouds, and nitrogen overload.

#### **Regulatory Agencies**

Because Great Smoky Mountain National Park is located in Blount, Sevier, and Cocke counties of Tennessee and Swain and Haywood counties of North Carolina,

the Tennessee Department of Environment and Conservation and the North Carolina Department of Environment and Natural Resources are the governing authorities for regulating air pollution.

#### Air Quality Standings

The counties in Tennessee and North Carolina where Great Smoky Mountain National Park is located are currently classified as "attainment" for all the National Ambient Air Quality Standards (NAAQS). However, with the exception of Cocke County, Tenn., the Governors of both Tennessee and North Carolina have recommended that Great Smoky Mountain National Park be designated as "non-attainment" for the eight-hour ozone standard.

Data from five ozone monitoring stations throughout Great Smoky Mountain National Park indicate that the eight-hour ozone standard was exceeded for a peak of 52 days in 1999, then declined to 31 and 14 days in 2000 and 2001, respectively. Data through September 2002 indicates that the eight-hour ozone standard was exceeded 43 times.

#### **NPS Position on Air Pollution**

It is the position of the National Park Service that new emission permits for industries and utilities in the region be granted only when "best available control technology" is planned and when offset reductions are taken to prevent any net increase in pollutants. The National Park Service supports the strictest possible state regulations on automobile and other emissions that contribute to the problem.

#### **Natural Resources Overview**

Geologically, the Cove is a natural "window" of younger limestone surrounded by an otherwise ancient, acidic-based rock complex. The Cove contains many species of plants and animals adapted to limestone soils, a habitat that is atypical in the southern Appalachians. The floor of the Cove is also believed to be the most species-diverse area of its size within the Park.

Cades Cove is a premier wildlife viewing area. Large and small animals that inhabit the area include deer, bear, turkey, raccoon, and fox. Wildlife viewing is one of the prime reasons for the traffic congestion on the Loop Road. Vehicles slow and stop to view deer on a regular basis. If a bear is spotted foraging in a cherry tree, traffic often stops and a so-called "Bear Jam" ensues on the Loop Road.



Figure 4 – Visitors stop along the Loop Road, creating a "Bear Jam"

#### Public Input on the Impacts of Visitation

Of the 371 public comments that were received as this report was being prepared, 17 percent voiced concern that visitors were affecting natural and cultural resources. An additional 10 percent voiced concern over air pollution. Resource-related comments related to visitors surrounding bears, driving vehicles into the fields, littering, trampling plants, creating new paths, and creating erosion problems by driving vehicles on embankments.

Many of these comments voiced a concern that the large volume of people visiting the Cove (particularly during peak seasons) has a negative impact on natural resources. However, there is no specific report or analysis that documents the impacts visitation has on natural resources in the Cove.

This report relies on the comments received and information provided in the draft management plan, as well as field observations made during the planning process. It is recommended that further documentation and assessment of these impacts be undertaken during subsequent phases of this project.

#### Management

Natural resources are in many ways linked to the history of settlement within the Cove. Early settlement information indicates that small tracts (10-12 acres in size) were established by girdling and clearing portions of the Cove. The soils were rich and crops included corn and wheat. Grazing was typically relegated to upland areas and balds. During this early settlement period, large areas of wetland and Cades Cove Opportunities Plan

D-12

Natural Resources Conditions

canebrake were left undisturbed because they were difficult to farm and because they provided excellent hunting and fishing grounds for the settlers.

As the population rose and fell during the 1950s, this pattern of agricultural production remained fairly stable. As the population declined in the 1960s, however, the National Park Service consolidated small tracts of land and entered into private lease agreements for the grazing of cattle. Management of the fields during this period had two objectives. The first was to maintain approximately 2,000 acres of the Cove in an open vista-meadow configuration. The second was to increase agricultural productivity.

The National Park Service's implementation of this management program, following recommendations from the Soil Conservation Service (SCS), drained wetlands and introduced tall fescue (*Festuca pratensis*), an exotic grass. At the time, these practices were considered the best techniques for conserving soil and water resources and increasing farm productivity. Although these were appropriate objectives for agriculture and low cost methods for maintaining open vistas, these management techniques were not historically accurate to Cades Cove. Consequently, these changes not only altered the Cove's complex ecosystem and reduced favorable habitats for many native plants and animals but also altered the appearance of the Cove. Another consequence of this choice of management is that it led to misinterpretation of the Cove by the visiting public.

Today, management of the Cove is transitioning from large scale agriculture. Only one hay permit for the horse concession remains, and cattle no longer graze in the Cove. The current management philosophy seeks to promote sustainable management of the Cove in a manner that improves the condition of natural resources while also providing a setting that is more consistent with the Cove's period of significance. For example, fields in the Cove are currently being managed under an interim maintenance schedule that includes mowing, burning and bush-hogging. The timing of these activities is critical to the survival of fawns, birds and small mammals, all of which use the tall grasses for cover. Under this schedule, fields adjacent to the Loop Road are being mowed twice a year. Interior fields are being managed on a three-year rotation to maintain them as open while also providing important wildlife cover and habitat.

#### Objectives of the DRAFT Land Management Plan

Natural resources management for Great Smoky Mountain National Park is guided by the Natural Resources Plan adopted in 1999. Recognizing the unique character of the Cove, the National Park Service undertook a more detailed management plan than was adopted for the entire Great Smoky Mountain National Park. However, the DRAFT Land Management Plan for the Cades Cove Cultural District has not been adopted and an interim field maintenance schedule is being followed. It is the intention of the National Park Service to coordinate development of a final field management plan with the Cades Cove Opportunities Plan.

An important component of the DRAFT Land Management Plan is that it attempts to blend the best of natural and cultural resource practices. It sets an objective for the National Park Service to manage the Cove in an environmentally sound manner, while portraying the historic scene of the Cove as accurately as possible.

Other objectives set forth in the DRAFT Land Management Plan seek to:

- Establish guidelines, accountability, and directives for the management of historic fields and landscapes in the Cades Cove Cultural District.
- Manage the historic landscape, where practical and with methods that do not detract from the historic scene and in concert with wildlife and other natural resources considerations in the area.
- Establish prescriptions for maintaining fields at an acceptable historic, aesthetic and environmental level.
- Experiment with cost-effective alternatives for vista maintenance and management.
- Reestablish the historic appearance of fence-rows, field edges, field sizes, and streams where environmentally permissible and in concert with visitor observation areas.
- Allow use of the fields by visitors for hiking, picnicking, and other pedestrian travel not historically distracting or environmentally damaging.
- Encourage wildlife observation as a recognized visitor pastime in concert with the historic theme of the area.
- Remove invasive, exotic (non-native) plant and animal species and restore native plant communities where possible without compromising cultural landscape objectives.

#### **Current Management Activities**

While Great Smoky Mountain National Park has not implemented the DRAFT Land Management Plan, some interim actions have been undertaken as the cattle lease agreements were phased out. These actions include:

Managing portions of the Cades Cove fields in smaller (10-12 acre) components

- Reestablishing field edges
- Meadow restoration demonstration project
- Prescribed burning
- Mowing
- Reestablishing fence-rows

#### **Benefits Derived from Land Management**

A variety of benefits may be derived from implementing the DRAFT Land Management Plan. The primary benefit is striking a balance between maintaining a naturally functioning environment that continues to be habitat to wildlife, while maintaining a setting that is culturally and historically in keeping with the aesthetics of the Cove. The Plan also identified the following benefits:

Native Plants - Native grasses grow in large bunches, providing travel lanes and forage areas. Clumps of native grasses provide escape cover from avian and ground predators. These grasses provide an abundance of food for wildlife through seed and insect production. Deer browse on native meadow species, concealing young fawns in meadows, and using the flora as bedding in the winter. Native grasses provide improved habitat over exotic grasses for quail, meadowlarks, sparrows, woodcock, bobolink, and prairie warbler. Many of these species are experiencing declines throughout their ranges because of the loss of habitat.

Canebrakes - Native rivercane (Arundinaria gigantea) is one of America's most critically endangered plant species. Canebrake played a historic role in Cades Cove, providing a rich food source (protein/calcium/phosphorous) for domestic and native wild animals. Canebrake also provides important refuge for native wildlife species including deer and bear. Canebrake restoration will return the Cove to conditions prevalent in the settlement era and will encourage the perpetuation of a plant community that is now rare.

**Fences and Fence-rows** - Some of the fences found in Cades Cove are historic and represent the historical demarcation between landowners and farming activities. The fence-rows and the associated vegetation play an important role for wildlife cover and travel corridors in the Cove. Fences help to direct visitors and prevent them from driving through fields. The field management plan, developed in conjunction with the Cultural Landscape Report, incorporates a management policy for fences. Restoration and management of fence-rows will provide a habitat for native trees and shrubs that have declined in Cades Cove; these include American plum, red cedar,

shingle oak, butternut, southern crabapple, and wild senna. This will benefit both cultural and natural resources.

#### **Aquatic Life**

Wetlands, limestone sinkhole ponds, meandering streams, bogs, and marshes were primary components of the Cades Cove floor. These features were systematically modified or destroyed from the 1930s to the 1960s by draining, diversion, or filling by the National Park Service in cooperation with the Soil Conservation Service. These actions profoundly changed the historic and natural landscape. Habitat for amphibians and birds was damaged or severely curtailed by these actions.

Observations of areas where cattle previously forded streams and fed en masse indicate that since their departure these bare, trampled areas have recovered, and a source of sedimentation has been reduced. In the future, all possible steps to prevent water quality degradation should be taken in order to protect these resources.

#### Actions Steps of the DRAFT Management Plan

In the mid 1990s, a hay lease at the west end of the Cove expired. The Park then developed a plan to manage this former hay lease in a way that would keep the area open but through a schedule that combined mowing and burning in smaller field units, with the intent of better mimicking the small field patterns that existed prior to establishment of the Park.

This area included a small area of native grasses from which the Park has been collecting seed and has established native grass seed increase fields. The plan developed for the former hay lease calls for the size of the native grass increase fields to gradually increase to roughly 20 acres. Currently, there are approximately fifteen acres of native grass increase fields, none of which are located adjacent to the Loop Road. Areas along the Loop Road are considered to be viewshed areas and are mown more frequently than interior fields. The Park has begun to use these basic management techniques on interim basis to manage former cattle leases on the east end of the Cove.

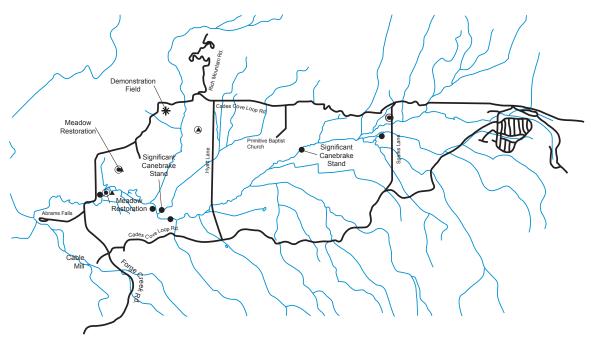


Figure 5: Canebreak and Meadow Restoration sites

#### Natural Resources Management History

Two documents provide information on the existing conditions of natural resources in the Cove. The first is the Resources Management Plan for Great Smoky Mountain National Park (adopted 4/2/1999); the second is the DRAFT Land Management Plan for the Cades Cove Cultural District developed in December 1999. It is important to note that the DRAFT Land Management Plan for the Cades Cove Cultural District has not been adopted.

#### **References**

Schell, Carroll; Chapman, David; Johnson, Kris; McCoy, Steve. DRAFT Land Management Plan for the Cades Cove Cultural District. Great Smoky Mountain National Park, January 1999. This plan outlines the relationship of natural resources management to cultural and historic resources, and education. The plan identifies management options and review procedures for fields, exotic plants, fence-rows, and aquatic resources.

Great Smoky Mountains National Park - Resources Management Plan. Adopted April 2, 1999. This plan provides an overview of the resources and programs within Great Smoky Mountain National Park. It inventories staffing needs, natural resources, cultural resources, and museum collections. The plan document also includes project statements for both natural and cultural resources.

Johnson, Kristine. Streambank Restoration in Cades Cove. Great Smoky Mountain National Park (DRAFT). Undated memo. This is a funding proposal for streambank restoration projects within Cades Cove. It defines the problem related to wetland alterations and identifies activities to stabilize and rehabilitate streambanks within the Cove.

University of Tennessee's Energy, Environment and Resources Center Presents. Sightline, Resources in Great Smoky Mountain National Park, Special Cades Cove Issue. Winter/Spring 2002 Vol. 3 No. 1. This issue includes articles specific to Cades Cove covering topics related to management proposals of the past; issues with rapidly increasing visitation to the Cove, and the effects of traffic congestion; the unique history and ecology of the Cove; how the preserved houses and barns allow visitors to experience history; and the issues and challenges related to exotic plants in the Cove.

Fulcher, Bob. "Raising Cane in Tennessee." The Tennessee Conservationist, July/August 2002. This magazine article provides an overview of the historical significance of canebrake in Tennessee, as it relates to both wildlife and human settlement.

Shaver, Christine L.; Tonnessen, Kathy A.; Maniero, Tonnie G. "Clearing the Air at Great Smoky Mountain National Park." The National Parks Service Website. This article outlines the implication of the "Class I" congressional designation in the Smokies, as well as on-going air quality monitoring and research. In addition, the article identifies policy and regulatory initiatives and coordination with state and regional agencies.

Great Smoky Mountains National Park Management Folio # 2 – Air Quality. Produced by Great Smoky Mountains Natural History Association and the National Park Service 9/2001. This newsletter-type document is sold at the Cable Mill Bookstore in Cades Cove. The document is designed to inform the public of research being undertaken on air quality and the issues and impacts of air pollution. It describes how air quality monitoring has helped to determine how wind currents have carried pollution from burning coal, oil and gas into the Park and how air pollution has degraded and threatens both people and plants. The Folio highlights federal legislation and how the National Park Service is working to find solutions to these problems.